

PROXICHIONE (PELECYPODA: VENERIDAE) FROM THE TERTIARY OF SOUTH-EASTERN AUSTRALIA

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Abstract

Six species of *Proxichione* are recorded from the Tertiaries of Victoria, Tasmania, and South Australia, i.e. *P. etheridgei*, *P. hormophora*, *P. dimorphophylla*, *P. subtilicostata*, *P. moondarae*, and *P. cognata*. Of these, *P. subtilicostata* and *P. moondarae* are new and *P. cognata* is represented by so few individuals that its validity is open to question. The type specimens of previously described species are refigured.

Introduction

When Iredale (1929, p. 339) introduced the genus *Proxichione*, he did so without reference to its relationships with other genera and while some later authors, e.g. Singleton (1945), have recognized that the genus is separable from others, no detailed descriptions and comparisons have been given, thus leading to some confusion of its relationships and validity. Iredale (1930, p. 136) also noted that the living species had fossil ancestors but he did not list any species. Singleton (1945, p. 255) listed the Tertiary fossils, *Chione cognata* Pritchard and *C. etheridgei* Pritchard, under the subgenus *Proxichione* which was placed in the genus *Antigona* Schumacher 1817. Cressin (1950, p. 154) retained this arrangement when she recorded *Antigona (Proxichione) cognata* (Pritchard) from the Lakes Entrance Oil shaft but, later, Keen (1954, p. 52) synonymized *Proxichione* with *Periglypta* Jukes-Browne 1914. In her monograph on the fauna of the Dry Creek Sands, Ludbrook (1955, p. 65) synonymized *Proxichione* with *Antigona* and recorded *A. cognata* from the Dry Creek Sands, comparing this species with *A. listeri* (Gray) and *A. reticulata* (Linnaeus). The latter two species, however, while strongly resembling the Pliocene shell, are generally placed in *Periglypta*, a similar but distinct genus which has not been found fossil in SE. Australia. Cotton (1961, p. 265) has also compared *cognata* with *Periglypta puerpera* (Linnaeus), type species of *Periglypta*.

Proxichione belongs to a group of genera and/or subgenera which resemble each other closely as they have rather similar radial ribs and concentric lamellae but differ in details of hinge, escutcheon, and pallial sinus. The group comprises *Antigona* Schumacher 1817 (Type species *A. lamellaris* Schumacher), *Ameghinomya* von Ihering 1907 (Type species *Chione argentina* von Ihering), *Periglypta* Jukes-Browne 1914 (Type species *Venus puerpera* Linnaeus), *Proxichione* Iredale 1929 (Type species *P. materna* Iredale), and *Tigammoua* Iredale 1930 (Type species *T. persimilis* Iredale). The diagnostic features of each of these are as follows:

Antigona: pallial sinus small and triangular; left anterior lateral LAII well developed, the corresponding socket in the right valve well defined.

Periglypta: pallial sinus large and rounded; left anterior lateral LAII scarcely developed and missing in some species; escutcheon prominently grooved.

Proxichione: pallial sinus large and angular; left anterior lateral LAII weakly developed; escutcheon normal without groove.

Tigammona: similar to *Proxichione*, possibly the only differences, apart from size, are the lamellae which are not recurved and the depressed or concave escutcheon, a feature which may or may not be well developed. Adult specimens of *Tigammona chemnitzii* (Hanley) are so close to *Proxichione materna* that they are possibly congeneric.

Ameghinomya: in external appearance resembles *Periglypta* but lacks the grooved escutcheon (von Ihering 1897, Pl. 7, fig. 45). The interior has never been adequately figured. Keen (1954, p. 53) has commented on our meagre knowledge of the genus.

Distribution

Proxichione has received scant attention in the literature and, thus, little is known of its present-day distribution. If the author's interpretation of the living species is correct it occurs on the E. and W. coasts of Australia, in New Guinea, and possibly in the Philippines. The genus is not found living in southern New South Wales, Victoria, and South Australia. The following table gives the stratigraphical and geographical distribution of the fossil species.

Proxichione

<i>etheridgei</i> (Pritchard 1903)	Janjukian	Torquay, Vict.
<i>hormophora</i> (Tate 1885)	Janjukian- Batesfordian	Table Cape, Tas.; Torquay, Birregurra, Gippsland, Vict.
<i>dimorphophylla</i> (Tate 1885)	Batesfordian	Morgan, S.A.
<i>subtilicostata</i> sp. nov.	Balcombian- Bairnsdalian	W. & C. Vict.
<i>moondarae</i> sp. nov.	Bairnsdalian (?) - Cheltenhamian	Gippsland, W. & C. Vict.
<i>cognata</i> (Pritchard 1903)	Kalimnan	W. Vict.; Adelaide, S.A.

Family VENERIDAE

Subfamily VENERINAE

Genus *Proxichione* Iredale 1929

Proxichione Iredale 1929, *Austr. Zool.* 5 (4): 339.

? *Tigammona* Iredale 1930, *Rec. Austr. Mus.* 17 (9): 396.

Type species (monotypy): *Proxichione materna* Iredale 1929.

Shell large, equivalve, ovate to subtriangular; umbones prosogyral. Sculpture of strong radial ribs, crossed by delicate concentric lamellae which are corrugated at the contact with the ribs. In most species, if not all, the corrugations fade out away from the surface of the valve and the lamellae are recurved. Lunule sunken and bounded by an incised line, ornamented with thin sharply raised lamellae continuous with the lamellae of the shell. Escutcheon well developed, broad and elongate, on left valve somewhat smooth with thin growth lines continuous with the lamellae of the shell, on right valve bearing lamellae continuous with those of the shell.

	3a	1	3b	
Tooth formula	LAII	2a	2b	4b

RV

3a lamellar; 1 narrow, triangular and slightly grooved; 3b broad, well developed and grooved in some species, the groove almost splitting the tooth into two halves. Socket for LAII missing or weakly developed. Posterior laterals absent.

LV

LAII generally very poorly developed; 2a narrow, triangular; 2b very broad and deeply grooved; 4b very thin and elongate, situated close to the nymph.

Muscle scars subequal, the anterior slightly smaller. Pedal impression separated from the anterior sear by a thin ridge of callus. Interior of valve margins denticulate, the denticulations suppressed on the posterior side.

Proxichione materna Iredale 1929

(Pl. 24, fig. 22-3)

Proxichione materna Iredale 1929, *Austr. Zool.* 5 (4): 339, Pl. 37, fig. 2-3.

LOCATION OF TYPE: Australian Museum, Sydney, Holotype C57838.

TYPE LOCALITY: Sydney Harbour.

DISTRIBUTION: Not known.

REMARKS: *Venus laqueata* Sowerby and *Venus chemnitzii* Hanley are very similar to *Proxichione materna* but differ in not having recurved lamellae. If these are not considered to be congeneric, the distribution of the genus will probably be much more restricted than that given above.

Proxichione etheridgei (Pritchard 1903)

(Pl. 21, fig. 3; Pl. 22, fig. 13; Pl. 24, fig. 26-8)

Chione etheridgei, Pritchard 1903, *Proc. Roy. Soc. Vict.* 15: 99, Pl. 12, fig. 1. Singleton 1945, *ibid.* 56: 255.

DIAGNOSIS: A *Proxichione* with a short rather rounded posterior margin and broad flattened ribs. Tooth 4b well developed and well separated from the nymph.

DESCRIPTION: Shell elongate, oval; umbones high and pointed, curved anteriorly; posterior end generally attenuated, rarely truncated. Ornament of closely spaced rather wide and flattened ribs which occasionally bifurcate, particularly towards the anterior end. At about 5 cm from the umbo there are 11-14 ribs/2 cm.

In the left valve, tooth 4b is well developed and separated from the nymph by a wide groove.

DIMENSIONS:

MUGD 1752	LV	L 65	H 52	T 18	12 ribs/2 cm	
P23715	RV	64	52	17	12	„ „ } Ledge, Bird
P23720	RV	58	50	17	11	„ „ } Rock Cliffs

LOCATION OF TYPES:

Holotype, Melb. Uni. Geol. Dept MUGD 1752.

Hypotypes, Nat. Mus. Vict. P23715, P23720 Cudmore Collection.

TYPE LOCALITY: Lower beds at Bird Rock bluff near Torquay. Jan Juc formation, Janjukian.

STRATIGRAPHIC RANGE: Janjukian, Jan Juc formation but not the 'Chione beds'.

OCCURRENCE: Common in the strata beneath Bird Rock cap including Ad 21, Ad 22, Ad 23, and the lower part of Ad 24 (Geological Survey localities).

MATERIAL: Type specimen. 3 specimens from Ad 21, P2362-8; 2 specimens from Ad 22 P23629-30; P23631 from Ad 23; 2 specimens from Ad 24 P23632-36, and 31 other specimens P23644-23673.

REMARKS: The coarse ribs, triangular shape, and nature of tooth 4b distinguish this species from all others of the genus.

***Proxichione hormophora* (Tate 1885)**

(Pl. 21, fig. 2; Pl. 22, fig. 11-2; Pl. 23, fig. 16-7)

Chione (*Timoclea*) *hormophora* Tate 1885, *Proc. Roy. Soc. Tas.* for 1884: 230. Tate 1887, *Trans. Roy. Soc. S. Aust.* 9: 155, Pl. 15, fig. 1a, b.

DIAGNOSIS: A *Proxichione* with a large posterior margin truncating the dorsal and ventral margins; dorsal and ventral margins sub-parallel; the whole valve rounded in outline.

DESCRIPTION: Shell sub-circular to elongate oval, somewhat inflated; umbones low, strongly curved anteriorly and not produced beyond the dorsal outline; posterior end not attenuated; posterior margin truncating dorsal and ventral margins. Ornament of closely spaced fine ribs, 20-29 ribs/2 cm at about 5 cm from the umbo. In the left valve, tooth 4b is almost in contact with the nymph.

DIMENSIONS:

T1156	LV	L 65	H 59	T 22	28 ribs/2 cm	Lower bed
P2818	LV	63	50	19	24 " "	Upper bed
P23687	LV	59	50	19	20 " "	' <i>Chione</i> bed'

LOCATION OF TYPES:

Holotype, Tate Museum, Geol. Dept, Adelaide Uni., T1156.

Hypotypes, Nat. Mus. Vict. P2818 Atkinson Collection; P23687 Colliver Collection.

TYPE LOCALITY: 'Table Cape'. The colour of the specimen indicates that it was collected from the basal grits or '*Crassatella*' bed at Fossil Bluff near Wynyard, Tasmania. Freestone Cove Sandstone, Longfordian.

STRATIGRAPHIC RANGE: Uppermost Janjukian-Batesfordian. The species occurs at Torquay in the '*Chione* beds' which are either uppermost Janjukian or lowermost Longfordian according to the position of the top boundary of the Janjukian. The age of the Freestone Cove Sandstone is considered to be Longfordian (D. J. Taylor pers. comm. Dec. 1964).

OCCURRENCE: Freestone Cove Sandstone and Fossil Bluff Sandstone at Fossil Bluff '*Chione* beds' Bird Rock cliffs, Torquay, Vict.

Lower bed at Skinners, SW. corner of allotment 29, Parish of Wuk Wuk, Gippsland, Vict.

? Birregurra, Vict.

MATERIAL: Type specimen and 6 topotypes P23614-8, P23625. Fossil Bluff Sandstone 6 specimens P23619-24. '*Chione* beds', Torquay 5 specimens P23685-90, P23676-7, P23803. Skinners 4 specimens P23855-8.

REMARKS: This species closely resembles *Proxichione dimorphophylla* Tate but differs in having a more rounded outline, a more strongly curved umbo, and the posterior end not attenuated. Chidley's drawing of Tate's single specimen is very good though the concentric lamellae are somewhat restored. The Birregurra record is based on a single small specimen from the Mulder Collection P23809.

Proxichione dimorphophylla Tate 1885

(Pl. 21, fig. 1; Pl. 22, fig. 8-10)

Chione (*Timoclea*) *dimorphophylla* Tate 1885, *Proc. Roy. Soc. Tas.* for 1884: 230. Tate 1887, *Trans. Roy. Soc. S. Aust.* 9: 155, Pl. 15, fig. 3a, b.**DIAGNOSIS:** An elongate, ovate *Proxichione* with a somewhat attenuated posterior end and fine radial ribs.**DESCRIPTION:** Shell elongate oval; umbones prosogyral and protruding beyond the dorsal outline. Posterior end slightly attenuated and then truncated. Ornament of fine ribs about 23-30 ribs/2 cm at about 5 cm from the umbo.**DIMENSIONS:**

Holotype 1155 D Pair L 57 H 46 T 33 23 ribs/2 cm

Hypotype 1155 C RV 55 45 17 23 „ „

LOCATION OF TYPES: Tate Museum, Geol. Dept, Adelaide Uni., Holotype T1155D, Hypotype T1155C.**TYPE LOCALITY:** 'River Murray Cliffs' South Australia. '4 miles downstream from Morgan on the east bank of the River Murray on Section C, hundred of Cadell'. (Ludbrook 1961, p. 53.) Cadell Marl lens of the Morgan Limestone. Batesfordian.**STRATIGRAPHIC RANGE:** Batesfordian.**OCCURRENCE:** Type locality.**MATERIAL:** Type specimens and 73 topotypes P23730-23802.**REMARKS:** The specimen which is taken as the holotype is the only pair with correct dimensions in Tate's series. Chidley's Fig. 3b gives a reasonably accurate representation of the specimen but Fig. 3a has the concentric lamellae much restored. Tate mentions only one specimen and the pair taken as the holotype is the only specimen which resembles Fig. 3a.**Proxichione subtilicostata** sp. nov.

(Pl. 21, fig. 4-7)

ETYMOLOGY: Latin *subtilis* thin or slender and *costa* a rib, referring to the fine ribs of the species.**DIAGNOSIS:** An elongate ovate *Proxichione* with very fine radial ribs and large posterior margin.**DESCRIPTION:** Shell elongate ovate to subrectangular; umbones curved anteriorly protruding a little from the dorsal outline. Dorsal margin somewhat declined posteriorly, abruptly truncated by the posterior margin. Radial ornament of very fine ribs, 30-40 ribs/2 cm at about 5 cm from the umbo.**DIMENSIONS:**

Holotype RV P23822 L 63 H 50 T 20 40 ribs/2 cm

Paratype LV P23831 59 51 20 35 „ „

Paratype LV T1155B 52 43 17 32 „ „

LOCATION OF TYPES: Nat. Mus. Vict.. Holotype P23822, Paratype P23831 Pritchard Collection.

Tate Museum, Geol. Dept, Adelaide Uni., paratype T1155B Tate Collection.

TYPE LOCALITY: Clifton Bank, Muddy Ck, Hamilton, Victoria, Muddy Creek Marl, Balcombian.

STRATIGRAPHIC RANGE: Balcombian-Bairnsdalian.

OCCURRENCE:

Baleombian. Type locality.

Grange Burn, W. bank downstream from the small bridge.

Grange Burn, downstream end of Porphyry Gorge P23925.

Shelford P23844.

Murgheboluc section 4a near junction of Bruces Ck and Barwon R. P23839.

Murgheboluc section 2b on Barwon R. P23845.

Murgheboluc West P23838.

? Native Hut Ck P23840-1.

? Altona Bay coal shaft P23837.

Ad 28 Orphanage Hill Fyansford P23846.

Bairnsdalian. Ad 15 Western Beach Geelong P23847-54.

Grices Ck downstream section P23872-6.

S. of Manyung Rocks P23867, P23877, J23869-70.

MATERIAL: Type specimens and 24 topotypes P23811-35.

REMARKS: This widely occurring species was for many years identified as *Proxichione dimorphophylla* but differs from the latter in having much finer ribs and a large posterior end which is not attenuated. The author is grateful to Mr P. Singleton for his suggestion of the specific name.

***Proxichione moondarae* sp. nov.**

(Pl. 23, fig. 18-21)

Antigona (Proxichione) cognata (Pritchard) Crespin 1950, *Proc. Roy. Soc. Vict.* 60: 154, Pl. 14, fig. 5.

ETYMOLOGY: Moondara, place name of the type locality.

DIAGNOSIS: An ovate *Proxichione* with a broad posterior margin and broad flattened radial ribs.

DESCRIPTION: Shell oval, umbones curved anteriorly somewhat protruding; posterior margin large but scarcely differentiated from the ventral margin. Radial ornament of broad flattened ribs 10-15 ribs/2 cm at about 5 cm from the umbo.

DIMENSIONS:

Holotype	P23082	RV	L 63	H 54	T 20	14 ribs/2 cm	
Paratype	P23083	LV	63	54	19	13	" "
Paratype	F17004	RV	59	51	19	14	" "

LOCATION OF TYPES: Nat. Mus. Vict. Holotype P23082, Paratype P23083.

Tate Museum, Geol. Dept, Adelaide Uni., Paratype F17004. All collected by T. A. Darragh.

TYPE LOCALITY: Moondara Farm G.S.V. F 72 Bairnsdale Shcct. Grid Reference 512341. See Darragh 1965, p. 103. Tambo River Formation. Uppermost Mitchellian.

STRATIGRAPHIC RANGE: Bairnsdalian-Cheltenhamian.

OCCURRENCE:

- Bairnsdalian Lake Bullenmerri P23859-66.
Warrambine Ck near Inverleigh, Geelong Sheet 090982,
P23084.
Rutledges Beach near Port Campbell P23908.
Mitchellian Type Locality.
Cheltenhamian Beaumaris, shell band at base of cliff P23902-6.
Mississippi Ck, Tramway Cutting G.S.V. F 2 Bairnsdale
Sheet 878332, P23889-92.

MATERIAL: Type specimens and 10 topotypes. Much of the other material is in the form of fragments or single specimens from the various localities.

REMARKS: The specimens which come from the Bairnsdalian localities and Beaumaris possibly differ; however, until more material is available the matter is in doubt. The form of radial rib recalls *Proxichione etheridgei*, but that species is more triangular than *P. moondarae* having a higher umbo and smaller posterior margin.

***Proxichione cognata* (Pritchard 1903)**

(Pl. 22, fig. 14-5; Pl. 24, fig. 24-5)

Chione cognata Pritchard 1903, *Proc. Roy. Soc. Vict.* 15: 101, Pl. 12, fig. 5. Singleton 1945, *ibid.* 56: 255.

Antigona (Antigona) cognata (Pritchard) Ludbrook 1955, *Trans. Roy. Soc. S. Aust.* 78: 66.

DIAGNOSIS: An elongate *Proxichione* with a broad posterior margin, posterior end of valve little attenuated and with dorsal and ventral margins subparallel.

DESCRIPTION: Shell elongate, almost rectangular, very little inflated; umbones strongly curved anteriorly and not produced beyond the dorsal outline. Posterior end very little attenuated; dorsal and ventral margins truncated by the large posterior margin. Ornament of fine ribs, 24 ribs/2 cm at 5 cm from umbo (measurement from 2 valves only).

DIMENSIONS:

Holotype	MUGD 1755	LV	L 68	H 53	T 19	24 ribs/2 cm
Hypotype	P23894	RV	70	54	21 24	„ „

LOCATION OF TYPES: Holotype, Melb. Uni. Geol. Dept MUGD 1755.
Hypotype, Nat. Mus. Vict. P23894.

TYPE LOCALITY: 'Grange Burn below Forsyths', Hamilton, Victoria. The blue grey coloration of the valves indicates that the holotype and hypotype both came from the silty clay bed at creek level which is immediately above the nodule bed. Grange Burn Formation. Kalimnan.

STRATIGRAPHIC RANGE: Kalimnan to Dry Creek Sands.

OCCURRENCE: Type locality.

Abattoirs Bore, Adelaide, South Australia P23895-7, P23899.

MATERIAL: Types and 4 broken valves from Abattoirs Bore.

REMARKS: The exact nature of this species is in doubt because only two specimens from the type locality are known, i.e. the type and a specimen in the Pritchard Collection which may be the specimen belonging to T. S. Hall mentioned in Pritchard's original description. There is no specimen of *Chione cognata* in the T. S. Hall Collection in the National Museum.

The specimens from the Abattoirs bore are fragmentary but the nature of the ribbing and the outline of the anterior dorsal margin match that of *Proxichione cognata* from Grange Burn. Ludbrook (1955, p. 66) has recorded the species from other bores penetrating the Dry Creek Sands.

This species is very similar in general appearance to *Proxichione hormophora* but is not as inflated and is much more clongate.

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Explanation of Plates

Fig. 2, 4-7, 14-21, 26-28 are from photographs by Mr Frank Guy. Fig. 3, 8-13, 24-25 are from photographs by the author. Fig. 22-23 are from Australian Museum photographs by Mr C. V. Turner (Copyright reserved).

PLATE 21

- Fig. 1—*Proxichione dimorphophylla* (Tate) T1155C, hypotype external right valve, R. Murray 4 miles below Morgan, S.A., $\times 1$.
- Fig. 2—*Proxichione hormophora* (Tate) P23687, hypotype external left valve, 'Chione bed', Torquay, Vict., $\times 1$.
- Fig. 3—*Proxichione etheridgei* (Pritchard), MUGD 1752, holotype internal left valve, Torquay, Vict., $\times 4$.
- Fig. 4—*Proxichione subtilicostata* sp. nov., P23831, paratype external left valve, Clifton Bank, Muddy Ck, Vict., $\times 1$.

- Fig. 5—ditto, paratype internal left valve, $\times 1$.
Fig. 6—ditto, P23822, holotype external right valve, $\times 1$.
Fig. 7—ditto, holotype internal right valve, $\times 1$.

PLATE 22

- Fig. 8—*Proxichione dimorphophylla* (Tate), T1155D, holotype internal left valve, R. Murray 4 miles below Morgan, S.A., $\times 1$.
Fig. 9—ditto, holotype external left valve, $\times 1$.
Fig. 10—ditto, holotype internal right valve, $\times 1$.
Fig. 11—*Proxichione hormophora* (Tate), T1156, holotype internal left valve, lower bed Fossil Bluff near Wynyard, Tas., $\times \frac{1}{2}$.
Fig. 12—ditto, holotype external left valve, $\times \frac{1}{2}$.
Fig. 13—*Proxichione etheridgei* (Pritchard), MUGD 1752 holotype external left valve, Torquay, Vict., $\times \frac{1}{2}$.
Fig. 14—*Proxichione cognata* (Pritchard), P23894, holotype external right valve, Grange Burn, Hamilton, Vict., $\times 1$.
Fig. 15—ditto, hypotype internal right valve, $\times 1$.

PLATE 23

- Fig. 16—*Proxichione hormophora* (Tate), P2818, hypotype internal right valve, upper bed Fossil Bluff near Wynyard, Tas., $\times 1$.
Fig. 17—ditto, hypotype external right valve, $\times 1$.
Fig. 18—*Proxichione moondarae* sp. nov., P23082, holotype internal right valve, Moondara Farm, Mitchell R., Gippsland, Vict., $\times 1$.
Fig. 19—ditto, holotype external right valve, $\times 1$.
Fig. 20—ditto, P23083, paratype external left valve, $\times 1$.
Fig. 21—ditto, paratype internal left valve, $\times 1$.

PLATE 24

- Fig. 22—*Proxichione materna* Iredale, C57838, holotype internal left valve, Sydney Harbour, N.S.W., $\times \frac{1}{2}$.
Fig. 23—ditto, holotype external left valve, $\times \frac{1}{2}$.
Fig. 24—*Proxichione cognata* (Pritchard) MUGD 1755, holotype external left valve, Grange Burn, Hamilton, Vict., $\times \frac{1}{2}$.
Fig. 25—ditto, holotype internal left valve, $\times \frac{1}{2}$.
Fig. 26—*Proxichione etheridgei* (Pritchard), P23720, hypotype external right valve, Torquay, Vict., $\times 1$.
Fig. 27—ditto, P23715, hypotype internal right valve, $\times 1$.
Fig. 28—ditto, hypotype external right valve, $\times 1$.